Approved For Release 2002/06/17 : CIA-RDP78B04747A002600030038-0

April 24, 1964

Gentlemen:

As a result of recent discussions concerning our proposal for a Variable Anamorphic Eyepiece, dated April 8, 1964, we are submitting some additional information in clarification of that document.

The attached drawing represents a 2X scaled drawing of the system presented in Figure 4 of the proposal, except that the mirror relay system has been replaced with the porro prism erector system. This results in a 1-1/2 inch decrease in overall length. The overall adapter extends 4-3/16 inches beyond the existing zoom 70 housing. [redacted] feels that this system offers many technical advantages in that it will provide the following range of anamorphic magnifications with interchangeable eyepieces. STAT

Eyepiece	Mag. X	Mag. Y	Angular Field (X)	(Y)
10X	15X	15X→5X	± 21°	± 8°
20X	30X	30X→10X	± 21°	± 21°
15X	22.5X	22.5X→7.5X	± 21°	± 11°
30X	45X	45X→15X	± 21°	± 21°

This system incorporates a 1.5X relay system which helps fill the exit pupil at the eyepiece, and in addition provides an image plane such that the existing Zoom 70 eyepieces may be utilized. [redacted] feels that proper design would provide a system sufficiently lightweight to allow operational use with the present Zoom 70 Stereo Microscope. STAT

In Paragraph 6.0 and the referenced Figure 6, a simplified approach is proposed. This system does not include the 1.5X relay system. Special eyepieces will provide anamorphic magnification as follows.

Mag. X	Mag. Y
10X	10X→3.3X
22.5X	22.5X→7.5X

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Anamorphic action at higher magnification would be seriously limited by the fact that since, image plane is between the cylindrical lenses, the available distance between focal point and higher magnification eyepiece lenses is too short to allow the focal point of the eyepiece to occupy the image plane.

There are many modifications to the basic system which could be proposed and implemented. In order to provide anamorphic magnification rather than demagnification, an optical layout and calculations have been made indicating that it is feasible to implement the alternate approach with a reversed position of the negative and positive cylindrical lenses.

STAT A spherical [redacted] lens is mounted in the position shown in Figure 6 in the proposal, at the position of the positive lens for maximum squeeze. This negative [redacted] lens at that location provides a magnification of approximately 1.64 and forms a real image external to the eyepiece tube of the [redacted] Zoom 70. The con- STAT figuration of Tube #1 is different in detail but it fits in the STAT eyepiece tube in the same functional manner as that shown in Figure 6. Tube #2 fits in Tube #1. Each has a stepped bore. The sliding negative cylindrical lens #1 is mounted in the small STAT diameter end near the [redacted] lens; the sliding positive cylindrical lens #2 is mounted in the large diameter end of Tube #2. This is just the reverse of the previous systems. The step in Tube #2 is substantially in the plane of the image formed by the STAT [redacted] lens. This image is the object for the negative cylindrical lens #1. The image formed by this lens is enlarged by an amount varying from a factor of 1.0 to 1.732 depending upon the axial position of lens #1. This enlarged image forms the object for lens #2. The final image formed by lens #2 coincides with the object for that lens; this parfocal condition results when the magnification produced by lens #1 is equal to that by lens #2; the absolute value of the focal length of lenses #1 and #2 is the same, namely about 75 mm. The axial positions of the positive and negative cylindrical lenses are mechanically controlled to maintain the parfocal condition for variable squeeze ratio. Knurled rings on Tubes #1 and #2 are controlled by the operator to set the squeeze ratio at the desired value between one and three.

The image formed by lens #2 is internal to the system and is viewed by an eyepiece which fits in Tube #2. The operator can select either the low power eyepiece or the high power eyepiece. The magnification in the X azimuth will be 5X with the low power eyepiece and 7X with the high power eyepiece.

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The corresponding magnifications in the Y azimuth will range from 5X to 15X with the low power eyepiece and from 7X to 21X with the high power eyepiece. Higher magnification eyepieces would be very difficult to design and implement since the image plane is, again, between the cylindrical lenses.

The size of the field of view will be limited by the rim of the eyepiece. Since this rim is circular, the field will be substantially circular though a slight amount of vignetting will result from having the field stop in a different plane from the image. This out-of-focus field stop appearance is not objectionable and might have operational advantages over a well defined elliptical field of view such as is provided in the previous configurations. The Variable Anamorphic Adapter will consist of a tube having two knurled rings for controlling the squeeze ratio (more properly called the "stretch" ratio). The azimuth of the "stretch direction" is adjusted by knurled ring #1. The magnification range may easily be changed by interchanging the accessory eyepieces supplied with the unit.

When this Variable Anamorphic Adapter is used in place of the standard eyepieces, the eye point is about 4.7 inches or 120 mm from the body of the instrument. With this extension there is enough spare range of interocular spacing on the [redacted] Zoom 70 STAT to accommodate the normal variation of interpupilary spacing of the observers.

STAT In conclusion, [redacted] feels that, of the many approaches investigated, the basic Variable Anamorphic Eyepiece as presented in the original proposal and modified in the attached drawing is the best overall solution to the problem. It is relatively compact, provides convenient operator controls and encompasses the widest range of anamorphic magnification (5X - 45X) for either eyepiece.

If we can be of any further assistance do not hesitate to contact me and I will be pleased to answer your request in an expeditious manner.

[redacted] STAT

Government Sales Manager

WDT/dg
Enclosures - 1 cy. of proposal
drawing (2 cys.)

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